US009636799B2

(12) **United States Patent**
Liu et al.

(10) **Patent No.: US 9,636,799 B2**
(45) **Date of Patent: *May 2, 2017**

(54) **ABRASIVE-DELIVERY APPARATUSES FOR USE WITH ABRASIVE MATERIALS IN ABRASIVE-JET SYSTEMS AND RELATED APPARATUSES, SYSTEMS, AND METHODS**

(71) Applicant: **OMAX Corporation**, Kent, WA (US)

(72) Inventors: **Peter H.-T. Liu**, Bellevue, WA (US); **Ernst H. Schubert**, Seattle, WA (US)

(73) Assignee: **OMAX Corporation**, Kent, WA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **14/728,822**

(22) Filed: **Jun. 2, 2015**

(65) **Prior Publication Data**

US 2015/0336239 A1 Nov. 26, 2015

Related U.S. Application Data

(63) Continuation of application No. 14/210,017, filed on Mar. 13, 2014, now Pat. No. 9,050,704.

(60) Provisional application No. 61/801,571, filed on Mar. 15, 2013.

(51) **Int. Cl.**
B24C 7/00 (2006.01)
B24C 1/04 (2006.01)

(52) **U.S. Cl.**
CPC ***B24C 7/0015*** (2013.01); ***B24C 1/045*** (2013.01); ***B24C 7/00*** (2013.01)

(58) **Field of Classification Search**
CPC .. B24C 1/045; B24C 5/04; B24C 7/00; B24C 7/0015
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

773,665 A 11/1904 Murray
3,201,901 A 8/1965 Pauli
3,270,464 A 9/1966 Bowling, Jr. et al.
3,543,444 A 12/1970 Mehta
(Continued)

FOREIGN PATENT DOCUMENTS

GB 2198975 A 6/1988

OTHER PUBLICATIONS

Operation Manual, Abrasive Delivery System, Type ADS-24-II, © Flow Europe GmbH Jul. 2000, 28 pages.

Primary Examiner — Dung Van Nguyen
(74) *Attorney, Agent, or Firm* — Perkins Coie LLP

(57) **ABSTRACT**

Abrasive-delivery apparatuses for use in abrasive-jet systems and associated apparatuses, systems, and methods are disclosed. An abrasive-delivery apparatus configured in accordance with a particular embodiment includes a first funnel segment and a second funnel segment downstream from the first funnel segment. The first funnel segment can have a first inlet, a first outlet, and a first interior region extending between the first inlet and the first outlet. Similarly, the second funnel segment can have a second inlet, a second outlet, and a second interior region extending between the second inlet and the second outlet. The first interior region can have a first inward taper toward the first outlet, and the second interior region can have a second inward taper toward the second outlet. The second inward taper can be steeper than the first inward taper when the abrasive-delivery apparatus is vertically oriented.

12 Claims, 6 Drawing Sheets